IEC Vertical F*C Series Fan Coils

INSTALLATION, OPERATION, & MAINTENANCE MANUAL

IEC International Environmental

BUILD YOUR REPUTATION ON OURS

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International Environmental Corporation (IEC) works continually to improve its products. As a result, the design and specifications of each product may be changed without notice and may not be as described herein. Please contact IEC for information regarding current design and product specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties but are merely IEC's opinion or commendation of its products. Manufacturer's standard limited warranty applies.

SECTION 1 – Introduction

International Environmental Corporation (IEC) fan coil units represent a prudent investment offering trouble-free operation and long service with proper installation, operation, and regular maintenance. The equipment covered by this manual is available with a variety of options and accessories. Always consult the approved unit submittals, order acknowledgement, and other manuals for specific details on unit options and accessories. Always follow proper procedures related to safety, handling, installation, operation, and servicing of mechanical equipment as the manufacturer assumes no responsibility for personal injury or property damage resulting from improper or unsafe practices during the handling, installation, service, or operation of any equipment.

Safety

IEC equipment is initially protected under the manufacturer's standard warranty; however, this warranty is provided under the condition that the steps outlined in this manual for initial inspection, proper installation, commissioning, regular periodic maintenance, and everyday operation of the equipment be followed in detail. This manual should be fully reviewed and understood in advance of initial installation, startup, and any maintenance. Should any questions arise, please contact your local Sales Representative or the factory BEFORE proceeding.

WARNING: NO ATTEMPT SHOULD BE MADE TO HANDLE, INSTALL, OR SERVICE ANY UNIT WITHOUT FOLLOWING SAFE PRACTICES REGARDING MECHANICAL EQUIPMENT.

The equipment must always be properly supported. Temporary supports used during installation or service must be adequate to hold the equipment securely.

CAUTION: All power must be disconnected before any installation or service is attempted. More than one power source may be supplied to a unit. Power to remote mounted control devices may not be supplied through the unit.

Install approved Lock-Out/Tag-Out protection devices on ALL incoming power sources to equipment being installed or serviced prior to beginning any work. Always verify all incoming power sources are de-energized using an electrical multi-meter.

CAUTION: Never wear bulky or loose fitting clothing when working on any mechanical equipment. Gloves should always be worn for protection against sharp sheet metal edges, heat, and other possible injuries. Safety glasses or goggles should always be worn, especially when drilling, cutting, or working with refrigerants, lubricants or cleaning chemicals.

WARNING: Never pressurize any equipment beyond specified test pressures listed on the unit rating plate. Always pressure test with an inert fluid or gas such as clear water or dry nitrogen to avoid possible damage or injury in the event of a leak or component failure during testing.

CAUTION: Always protect adjacent flammable material when welding or soldering. Use a suitable heat shield material to contain sparks or drops of solder. Have a fire extinguisher readily available.

CAUTION: Always protect chilled and hot water valve bodies, strainers, ball valves, and other flow control related devices from heat caused by soldering or brazing processes by wrapping these devices in cold or damp rags.

Safety should always be the first priority when handling, installing, operating or servicing mechanical equipment. Always follow all safety codes, procedures and protocols.

Consult applicable local building codes and National Electrical Codes (NEC) for special requirements. Be alert to safety information: symbols, words such as DANGER, WARNING and CAUTION.

Improper installation, adjustment, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions, which may result in personal injury or property damage. This product must be installed only by personnel with the training, experience, skills, and applicable licensing that makes him/her "a qualified professional HVACR installer."

SECTION 2 – Pre-Installation

Unpacking and Inspection

All units are carefully inspected at the factory throughout the manufacturing process under a strict detailed quality assurance program. All major components and sub-assemblies are carefully tested for proper operation and verified for full compliance with factory standards. Operational testing of some customer-furnished components such as DDC controls, pneumatic control valves and switches may be a possible exception.

Each unit is carefully packaged for shipment to avoid damage during normal transit and handling. Equipment should always be stored in a dry and covered place, and in the proper orientation as marked on the carton.

All shipments are made F.O.B. ex-factory and it is the responsibility of the receiving party to inspect the equipment upon arrival. Any obvious damage to the packaging and/or its contents should be recorded on the bill of lading and a claim filed with the freight carrier.

After determining the condition of the packaging exterior, carefully remove each unit from the carton and inspect for hidden damage. At this time, check to make sure that "furnished only" items such as switches, valves, thermostats, etc. are accounted for. Any hidden damage or missing components should be recorded and immediately reported to the carrier and a claim filed. In the event a claim for shipping damage is filed, the unit, shipping carton, and all packing must be retained for physical inspection by the freight carrier. All equipment shall be stored in the factory shipping carton with internal packing in place until installation.

At the time of receipt, the equipment type and arrangement shall be verified against the order documents. Should any discrepancy be found, the local Sales Representative shall be notified immediately so that proper action may be taken.

Should any questions arise concerning field warranty repairs, the factory must be notified BEFORE any corrective action is taken.

Where local repairs or alterations can be accomplished, the factory must be fully informed of the extent and expected cost of those repairs before work is begun. Where factory operations are required, the factory must be contacted for authorization to return equipment and a Return Authorization Number will be issued. Unauthorized return shipments of equipment and shipments not marked with an authorization number will be refused. In addition, any claims for unauthorized expenses will not be accepted by the manufacturer.

Prepare Jobsite for Unit Installation

To save time and to reduce the possibility of costly errors, set up a complete sample installation in a typical room at the jobsite. Check all the critical dimensions such as field piping, wiring, and duct connection to ensure they agree with job requirements. Refer to job drawings and product dimension drawings as required (See Figure 1 for sample drawing). Instruct all trades in their part of the installation. Should any discrepancies be discovered, contact your local representative before continuing with unit installations.

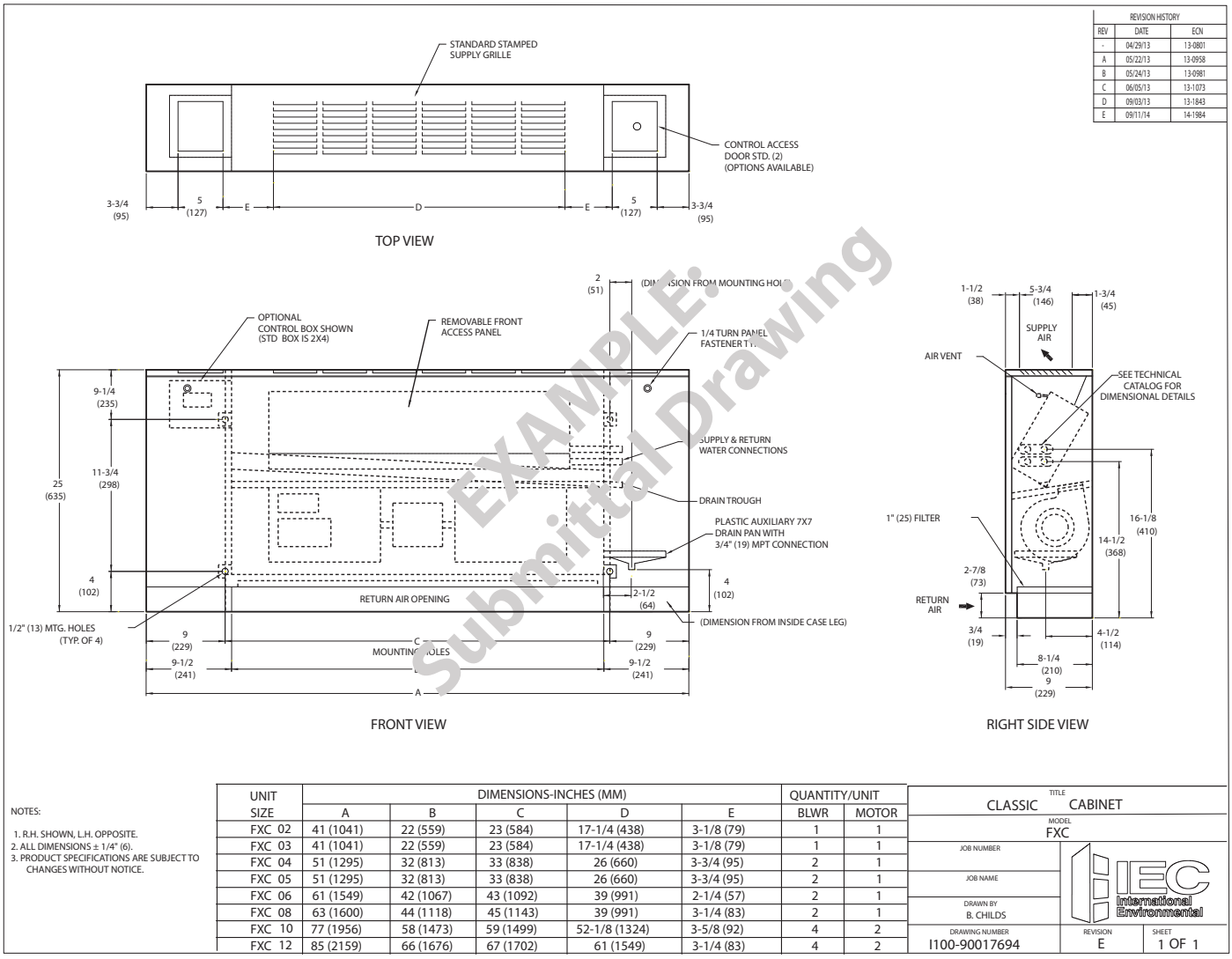
Identify and Prepare Units

For each unit, confirm incoming and control power requirements match available power source. Refer to unit nameplate and wiring diagram.

1. Check all tags on unit to determine if shipping screws are to be removed. Remove screws as directed.
2. Rotate the fan wheel by hand to ensure that the fan is unrestricted and can rotate freely. Check for shipping damage and fan obstructions. Adjust blower wheel as required.
3. Perform "Dry Fit" of valve assembly that may be shipped unattached to unit coil assembly. Should any questions arise on fit up please contact your local representative immediately.

Protect Units from Damage

All equipment is designed and fabricated with robust materials and present a rugged appearance. Still, great care must be taken to assure that no force or pressure is applied to the coil, piping or drain stub-outs during handling.


REVISION HISTORY
REV | DATE | ECN
- | 04/29/13 | 13-0801
A | 05/22/13 | 13-0958
B | 05/24/13 | 13-0981
C | 06/05/13 | 13-1073
D | 09/03/13 | 13-1843
E | 09/11/14 | 14-1984
STANDARD STAMPED SUPPLY GRILLE
CONTROL ACCESS DOOR STD. (2) (OPTIONS AVAILABLE)
TOP VIEW
OPTIONAL CONTROL BOX SHOWN (STD BOX IS 2X4)
REMOVABLE FRONT ACCESS PANEL
1/4 TURN PANEL FASTENER
SUPPLY & RETURN WATER CONNECTIONS
DRAIN TROUGH
PLASTIC AUXILIARY 7X7 DRAIN PAN WITH 3/4" (19) MPT CONNECTION
RETURN AIR OPENING
1/2" (13) MTG. HOLES (TYP. OF 4)
(DIMENSION FROM INSIDE CASE LEG)
FRONT VIEW
SUPPLY AIR
AIR VENT
SEE TECHNICAL CATALOG FOR DIMENSIONAL DETAILS
1" (25) FILTER
RETURN AIR
RIGHT SIDE VIEW
EXAMPLE: Submittal Drawing

NOTES:
1. R.H. SHOWN, L.H. OPPOSITE.
2. ALL DIMENSIONS ± 1/4" (6).
3. PRODUCT SPECIFICATIONS ARE SUBJECT TO CHANGES WITHOUT NOTICE.

UNIT SIZE	DIMENSIONS-INCHES (MM)					QUANTITY/UNIT	
	A	B	C	D	E	BLWR	MOTOR
FXC 02	41 (1041)	22 (559)	23 (584)	17-1/4 (438)	3-1/8 (79)	1	1
FXC 03	41 (1041)	22 (559)	23 (584)	17-1/4 (438)	3-1/8 (79)	1	1
FXC 04	51 (1295)	32 (813)	33 (838)	26 (660)	3-3/4 (95)	2	1
FXC 05	51 (1295)	32 (813)	33 (838)	26 (660)	3-3/4 (95)	2	1
FXC 06	61 (1549)	42 (1067)	43 (1092)	39 (991)	2-1/4 (57)	2	1
FXC 08	63 (1600)	44 (1118)	45 (1143)	39 (991)	3-1/4 (83)	2	1
FXC 10	77 (1956)	58 (1473)	59 (1499)	52-1/8 (1324)	3-5/8 (92)	4	2
FXC 12	85 (2159)	66 (1676)	67 (1702)	61 (1549)	3-1/4 (83)	4	2

TITLE: CLASSIC CABINET
MODEL: FXC
JOB NUMBER:
JOB NAME:
DRAWN BY: B. CHILDS
DRAWING NUMBER: I100-90017694
REVISION: E
SHEET: 1 OF 1
IEC International Environmental

Figure 1: Example of Submittal Drawing

Depending on the options and accessories, some units may contain delicate components that may be damaged by improper handling. Whenever possible, all units shall be maintained in an upright position, and handled by the chassis or as close as possible to the unit mounting-point locations. In the case of a full cabinet unit, the unit must be handled by the exterior casing. This is acceptable provided the unit is again maintained in an upright position, and no force is applied that may damage internal components or painted surfaces.

The equipment covered in this manual IS NOT suitable for outdoor installations. The equipment is never to be stored or installed where it may be subjected to a hostile environment such as rain, snow, or extreme temperatures.

Before, during, and after installation, take specific care to prevent foreign material such as paint, plaster, and drywall dust from being deposited in the drain pan, on the motor or blower wheels and cooling/heating coils. Failure to do so may have serious adverse effects on unit operation, and in the case of the motor and blower assembly, may result in immediate or premature failure. All manufacturers' warranties are void if foreign material is allowed to be deposited in the drain pan or on the motor or blower wheels of any unit. Some units and/or job conditions may require some form of temporary covering during construction.

While the manufacturer is not involved in the design and selection of support methods and components, it shall be noted that unacceptable system operating characteristics and/or performance may result from improper or inadequate unit structural support. In addition, adequate clearance must be provided for service and removal of the equipment and its accessory components, consult local codes. See Figure 2 for minimum recommendation for clearances by manufacturer. Anchoring the equipment in place is accomplished by using the mounting points provided, and positioning the unit to maintain the drain pan on a **LEVEL** plane. Care must be taken to insure that the unit drain pan does not slope away from the outlet connection.

Vertical unit models FHC, FXC, FVC are designed to be floor mounted or otherwise supported from below, and bolted to the wall or floor structure through the mounting holes provided in the chassis. These units may be wall hung only when originally ordered from the factory for wall-mount applications.

The type of mounting device is a matter of choice; however, the mounting point shall always be that provided in the chassis or cabinet. Refer to the unit product drawings for hole mounting locations and sizes.

After mounting, the unit is then ready for the various service connections such as water, drain and electrical. At this time, verify that the proper types of service are actually provided to the unit. On units requiring chilled water and/or hot water, verify the proper line size and water temperature are available to the unit.

SECTION 3 – Installation

Place Units In Position

F*C UNITS

1. Select the unit location. Allow adequate space for free air circulation, service clearances, piping and electrical connections, and any necessary ductwork. For specific unit dimensions, refer to the submittal drawing for your model. Allow clearances according to local and national electric codes. See Figure 2 for basic minimum clearance recommendations.
2. Make sure the floor is able to support the weight of the unit. See Table 1 for nominal unit weight.
3. Ensure wall behind unit is smooth and plumb; if necessary, install furring strips on walls with irregular surfaces or mullions. Furring strips must be positioned behind mounting holes in unit (FHC, FXC, FVC units).

   Fasteners, furring strips, and other seals (if required) must be field-supplied.
4. Remove all wall and floor moldings from behind the unit.
5. Ensure FHC top panel (under window application) and FXC, FVC front panel has been removed from unit to obtain access to the four 0.75-in. mounting holes. Fasteners and other required hardware must be field-supplied.
6. Move unit into position. Ensure unit is level or slightly pitched towards drain to ensure proper drainage and operation.

Unit Size F*C	**02**	**03**	**04**	**05**	**06**	**08**	**10**	**12**
Nominal Air Flow (cfm)	200	300	400	500	600	800	1000	1200
Shipping Weight (lb)								
FHC	42	47	57	60	77	79	108	127
FXC	63	68	82	85	99	101	133	154
FVC	64	69	83	86	100	102	135	156
Coil Weight w/Water (Approx. lbs per row of coil)								
FHC/FXC/FVC	0.4	0.5	0.6	0.8	1.0	1.1	1.8	2.1
Coils	5.7	7.4	7.6	11.6	14.5	15.1	24.5	27.7
FPI	12 FPI							
Coil Face Area (sq ft)	0.8	1.0	1.1	1.6	2.0	2.1	3.6	4.2
Motor (Qty) FHC/FXC/FVC	1	1	1	1	1	1	2	2
Blower (Qty) FHC/FXC/FVC	1	1	2	2	2	2	4	4
Filters (Nominal Size (in.) (1-in. thick)								
FHC/FXC/FVC	7¾ x 21¾	7¾ x 21¾	7¾ x 31¾	7¾ x 31¾	7¾ x 41¾	7¾ x 43¾	7¾ x 57¾	7¾ x 65¾
Qty	1	1	1	1	1	1	1	1
Supply Air Duct Collar	1-inch							
Piping Connections (Sweat) (in.)								
Coil Supply and Return	5/8" OD, 7/8" OD							
Drain Connection	3/4 MPT							

Table 1: Nominal Unit Weight

7. Adjust FHC, FXC, FVC units leveling legs so unit is level. See Figure 2. Unit must be level for proper operation and condensate drainage. (See Figure 5 for recommended connection methods/trapping)
8. Mounting unit: Reach into unit and attach unit to the wall using the 0.375-in. mounting holes (4) in top panel; do not use any other locations. The four mounting holes and hanger slots with rubber grommets are NOT for balancing unit.

NOTE: For any unit without a return-air duct connection, applicable installation codes may limit unit to installation in single story applications only.

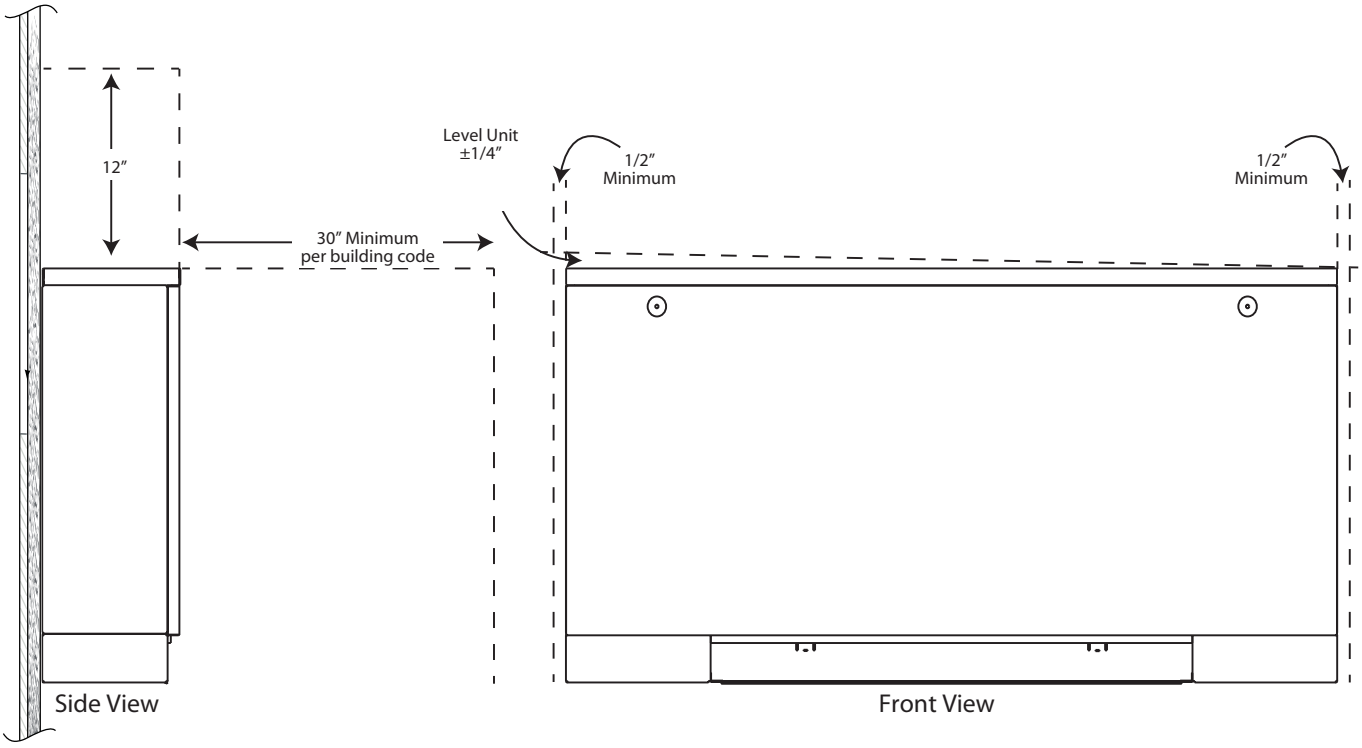


Figure 2: Clearance recommendations.

Cooling/Heating Pipe Connections

CAUTION: Residues and loose particles resulting from manufacturing and field piping techniques such as joint compounds, soldering flux, and metal shavings may be present in the unit and the piping system. Give special consideration to system cleanliness when connecting to solar, domestic or potable water systems.

Thoroughly review submittals and product literature detailing unit operation, controls, and connections BEFORE beginning the connection of the various cooling and/or heating mediums to the unit.

All accessory valve packages shall be installed as required, and check all service valves for proper operation. At times, valve packages may be shipped loose with the equipment. In these cases, perform a dry fit of the assemblies to ensure proper alignment and access to the assembly components can be utilized for maintenance and service.

If coil and valve package connections are made with a "sweat" or solder joint, verify that no components in the valve package are subjected to a high temperature which may damage seals or other materials. Do not allow valve bodies to exceed 300°F. Protect all valve and water control assemblies with wet or damp rag wrapped around the body during the soldering/brazing process.

Many two position electric control valves, depending on valve operation, are provided with a manual opening lever. Place this lever in the "open" position during all soldering or brazing operations.

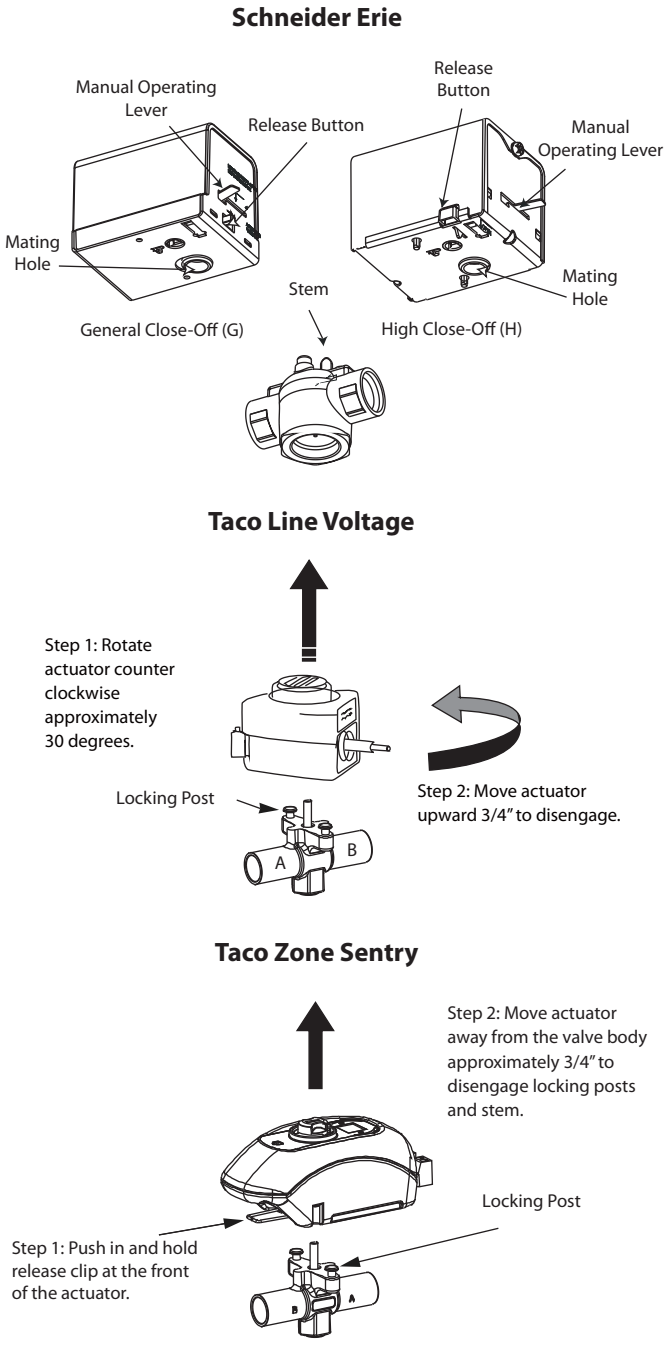

Schneider Erie
Manual Operating Lever
Release Button
Release Button
Manual Operating Lever
Mating Hole
Mating Hole
Stem
General Close-Off (G)
High Close-Off (H)
Taco Line Voltage
Step 1: Rotate actuator counter clockwise approximately 30 degrees.
Locking Post
A
B
Step 2: Move actuator upward 3/4" to disengage.
Taco Zone Sentry
Step 2: Move actuator away from the valve body approximately 3/4" to disengage locking posts and stem.
Locking Post
Step 1: Push in and hold release clip at the front of the actuator.

Figure 3: Valve and Lever–Pop-Top Installation

If the valve package connection at the coil is a union, the coil side of the union must be prevented from twisting ("backed up") during tightening to prevent damage to the coil tubing. Do not over tighten the union preventing distorting ("egg shaping") of the union seal surface and destroying the union.

The supply and return connections are marked on the coil stub outs and the valve package, with an "S" meaning supply or inlet and "R" meaning return or outlet indicating fluid flow direction to and into the coil. Blue letters mark the chilled water connections and Red letters mark the hot water or steam connections.

In the case of field-installed valves and piping, install the chilled water valve cluster (or expansion valve on DX units) in such a way that any dripping or sweating caused from condensation is contained in the drain pan or other device such as an optional extended drain pan or factory drip lip. Factory drip lips are field installed and may be packaged separately from the unit. Factory supplied cooling coil valve packages will be arranged to locate as much of the package as possible over a standard drip lip. Some field configurations may require additional insulation be applied to the exposed water piping to prevent condensation from dripping into areas not directly above the auxiliary drain pans.

If none of the above factory accessories are provided with the units, simple flashing may be used to carry moisture into the unit drain pan.

Field Piping Connections

To chilled water coil: IEC's innovative design incorporates 3/8" copper tubing inside and stubbing out of the coil. To facilitate ease of connecting to field supplied ½" hydronic tubing, there is a 3/8" to 1/2" swedge adaptor installed on both the supply and return water tube connections to the coil. Care must be taken when soldering the field supplied tubing to this connection.

The use of solder with a flow or initial melting point below 500°F is recommended to make these connections. Local codes and/or building specifications should always be consulted to ensure solder being used is compliant with current building standards. When making soldering connections, use a wet rag as a heat sink around the factory adaptor to prevent overheating of this joint. See Figure 4. After soldering, use the wet rag to quench the field and factory connections at this fitting.

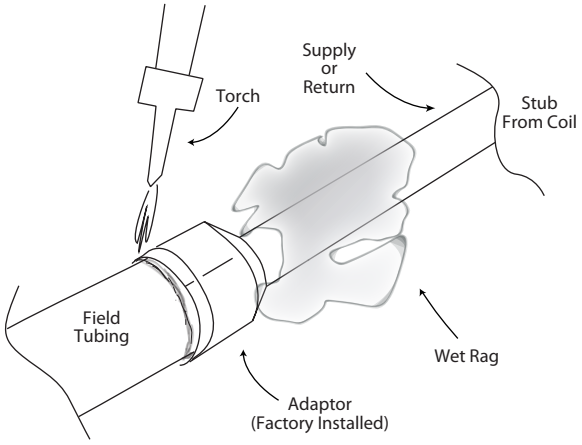


Figure 4: Field Piping Connections:

CAUTION: Piping must be adequately supported or equipment damage could result.

NOTE: The installing contractor is responsible for adequately supporting field mounted or field supplied valve packages or components. Once installed the valve package components must not impede or block condensate run off path from the drain trough to the drain pan.

NOTE: Copper connections should only be made with commonly available solder that melts (flows) below 500°F. Excessive overheating of connections may damage IEC equipment, valves, pipe integrity, etc.

Steam Drain Connections

Verify units with steam-heating coils have the proper line sizing and routing, and the maximum steam pressures applied never exceed 10 psig. The drain piping and steam trap are to be sized and routed to allow for proper condensate flow.

Leak Testing

After completing the connections, test the system for any leaks. Always test hydronic systems with water as some components are not designed to be inert gas pressurized.

Field pressure testing for leaks should not exceed 300 psi for hydronic coil and valve package components. Consult factory if higher limits are required.

CAUTION: Protect all water coils from freezing after initial filling with water. Even if the system is drained, unit coils may still hold enough water to cause damage when exposed to temperatures below freezing.

Refrigerant Coil Testing

Test refrigerant systems with dry nitrogen rather than air to prevent the introduction of moisture into the system. In the event that leaking or defective components are discovered, notify the Sales Representative BEFORE any repairs are attempted. All leaks must be repaired before proceeding with the installation.

Piping Insulation

After system integrity has been established, insulate the piping in accordance with the project specifications. This is the responsibility of the installing or insulation contractor. All chilled water piping and valves or refrigerant suction piping not located over drain pans or drip lips must be insulated to prevent damage from sweating. This includes factory and field piping inside the unit cabinet.

Condensate Drain

The condensate drain shall always be connected and piped to an acceptable disposal point. For proper moisture carry off, the drain piping shall be sloped away from the unit at least 1/8" per foot. A drain trap may be required by local codes and it is strongly recommended for odor containment. A minimum drain P-Trap of 2" is required to be connected to the primary drain outlet of the condensate pan. This connection must be serviceable during preventative maintenance. See Figure 5 below.

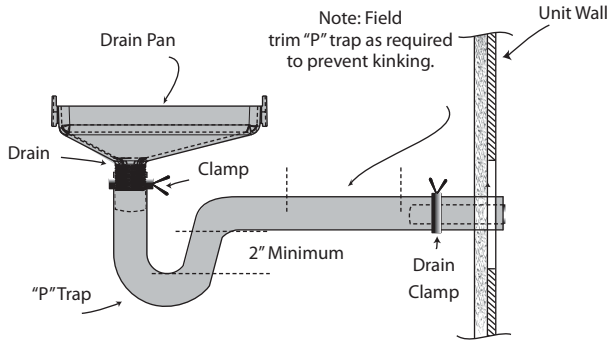


Figure 5: "P" Trap Minimum Configuration

Electrical Connections

The unit serial plate lists the unit electrical characteristics such as the required supply voltage, fan and heater amperage and required circuit ampacity. The unit wiring diagram shows all unit and field wiring. Since each project is different and each unit on a project may be different, the installer must be familiar with the wiring diagram and serial plate on the unit **BEFORE** beginning any wiring.

Incoming Power

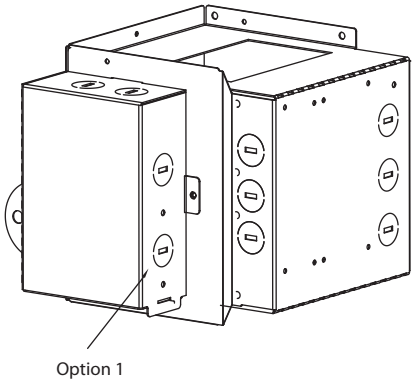


Figure 6: High Voltage Wiring Service Switch (Side Location)

Incoming Power

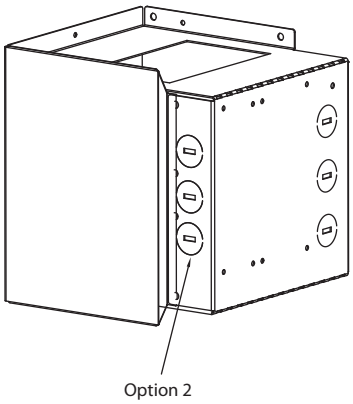


Figure 7: High Voltage Power Connection (Unit Without Service Switch)

Incoming Power

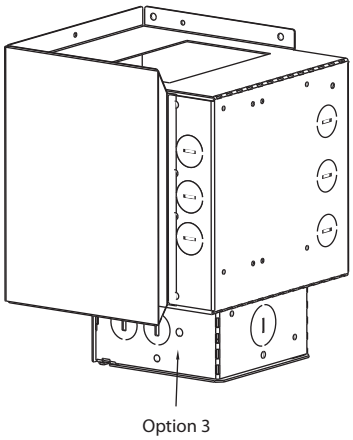


Figure 8: High Voltage Wiring Service Switch (Bottom Location)

Make sure all field electrical connections are in accordance with unit wiring diagram and all applicable national and local codes. The type and sizing of all wiring and other electrical components such as circuit breakers, disconnect switches, etc. shall be determined by the individual job requirements. Verify conductor size is suitable for the distance to the equipment connection and will support the equipment electrical load. All installations including field wiring shall be made in compliance with all governing codes and ordinances. Compliance with all codes is the responsibility of the installing contractor.

All components furnished for field installation by either the factory or the controls contractor shall be located and checked for proper function and compatibility. Check all internal components for shipping damage. Check all electrical connections within the unit control box and accessories and tighten if necessary.

Any devices such as fan switches or thermostats that have been furnished from the factory for field installation must be wired in strict accordance with the wiring diagram that appears on the unit. Failure to do so could result in personal injury or damage to components, and will void all manufacturer warranties.

Never control fan motor(s) by any wiring or device other than the factory-supplied switch or thermostat/switch combination unless prior factory authorization is obtained. Fan motor(s) may be temporarily wired for use during

construction only with prior factory approval and only in strict accordance with the instructions issued at that time.

Factory Installed Options

Aquastats: Units with optional factory-furnished and installed aquastats may be shipped with the aquastats mounted on a coil stub out. In this circumstance, remove the aquastat before installation of a valve package. Consult the factory piping diagram in the approved submittals for proper location when reinstalling the aquastats. If the valve package is field-furnished, the aquastat must be installed in a location where it will sense the water temperature regardless of control valve position. A bleed bypass may be required to guarantee proper aquastat operation. The aquastat bypass line allows a small amount of water to flow from the supply to the return piping when the control valve is closed for loop temperature sensing.

NOTE: The aquastat must be able to sense whether the flowing water is being chilled or heated and switches a contact closed to provide automatic summer or winter changeover for the system.

Condensate Overflow switch

The condensate overflow switch is used to detect a clogged or restricted condensate pan drain. The condensate switch uses a Normally Closed contact to allow the system control power to pass through the switch energizing the water valves and fans allowing normal operation. When an overflow condition is detected by the switch, it opens the NC contacts and de-energizes the water valves and fans.

NOTE: All field wiring must be in accordance with governing codes and ordinances. Any modification of unit wiring without factory authorization will invalidate all factory warranties and nullify any agency listings. The manufacturer assumes no responsibility for any damages and/or injuries resulting from improper field installation and/or wiring. Units may be equipped with line voltage controls or 24 V AC control systems. Some adjustment may be required for proper operation.

The following descriptions are for typical control sequences only. For detailed control operating sequence, refer to thermostat operating instructions.

Standard Wiring Packages

Manual Fan Control — On vertical cabinet units, a 3-speed fan switch may be furnished unit-mounted and wired. See Figure 9. On vertical furred-in units, the switch may be shipped separately on a decorative wall plate for field mounting and wiring. See Figure 10. The standard fan switch has LOW, MEDIUM, HIGH and OFF positions plus an auxiliary contact to energize thermostats, valves, dampers, etc.

NOTE: Wiring diagrams are for typical applications. If other voltages for heaters or controls are specified, wiring may differ from that shown. Refer to wiring diagram on unit blower housing or inside control box cover for unit specific wiring.

Thermostatic Electric Valve Control, 2-Pipe — A thermostatically controlled 2-position valve provides superior control to fan cycling. With this control, the fan runs continuously unless it is manually switched to the OFF or AUTO position. The fan must be on before the valve can be opened to supply water to the coil. This system can be used for normal 2-pipe changeover systems and can also be furnished for cooling-only or heating-only applications by omitting the changeover and specifying which application is intended. See Figure 11 for line voltage control and Figure 12 for 24 V control. Wiring diagrams show typical applications. Refer to the wiring diagram on each unit blower housing for unit specific wiring.

Thermostatic 2-Pipe Auxiliary Electric Heat with Valve Control — This system, also called twilight or intermediate season electric heat, goes a long way towards solving the spring and fall control problems of 2-pipe systems. Chilled water can be run late into the fall, turned on early in the spring and electric heat will still be available to all units whenever required. In winter, the system is switched over to hot water. Two changeover devices are required for this. One device switches the action of the thermostat and the other locks out the electric heat when hot water is in the coil.

With this system, the fan runs continuously unless manually switched to OFF or AUTO position. Fan must be on before thermostat can send signal to open chilled water valve or turn on electric heater.

Two control methods are available:

1. Use the standard automatic changeover thermostat with a dead band between heating and cooling.
2. Use a manual changeover thermostat. With this method only one changeover is required. Be sure to include a 2-way or 3-way electric valve with this system.

Thermostat 2-Pipe Total Electric Heat with Valve Control— With this system type, the complete heating requirement for the space is provided by the electric heater; the water system is never changed over for heating. It is therefore possible to have heating or cooling at any time of the year. The fan may run continuously unless it is manually switched to OFF or AUTO position. Fan must be on before thermostat can send signal to open chilled water valve or turn on electric heater.

Normally, an automatic changeover thermostat with a dead band between heating and cooling is used, but a manual changeover thermostat is also suitable. A 2-way or 3-way valve must also be used so that the chilled water is off whenever the heater is on. No changeover device to sense water temperature is necessary.

Thermostatic Electric Valve Control, 4-Pipe — This system configuration provides the complete heating requirement for the space by the hydronic heating coil. It is therefore possible to have heating or cooling at any time of the year. The fan may run continuously unless it is manually switched to OFF or AUTO position. Fan must be on before thermostat can send signal to open chilled water valve or the hot water valve.

Normally, an automatic changeover thermostat with a dead band between heating and cooling is used, but a manual changeover thermostat is also suitable. A 2-way or 3-way valves must also be used so that the chilled water valve is closed whenever the heating valve is open. No changeover device to sense water temperature is necessary.

NOTE: Wiring diagrams are for typical applications. If other voltages for heaters or controls are specified, wiring may differ from that shown. See Figure 11 for line voltage control. See Figure 12 for 24 V control. Refer to wiring diagram on unit blower housing for unit specific wiring.

Figure 9: Standard Fan Switch

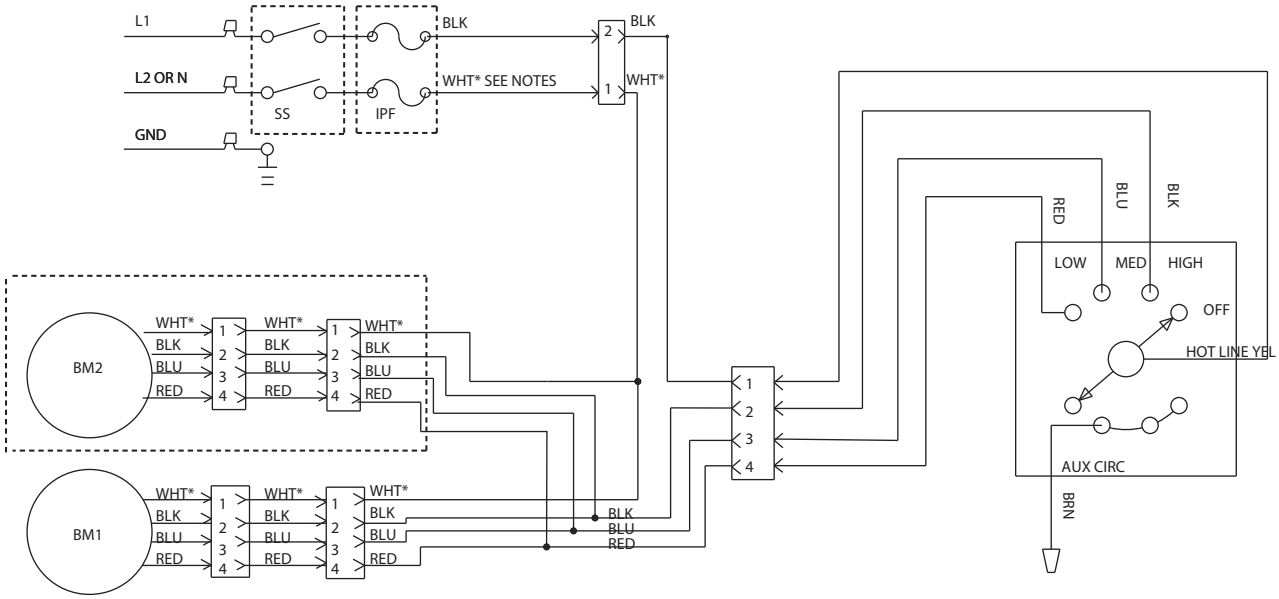


Figure 10: Switch with Decorative Wall Plate

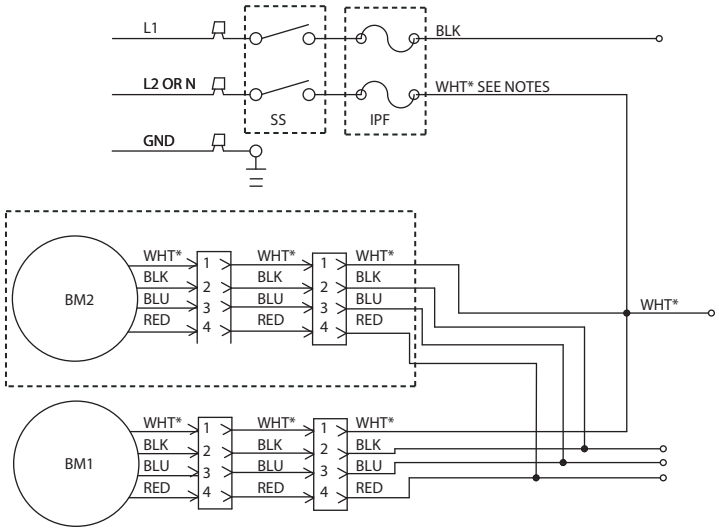


Figure 11: Line Voltage Control

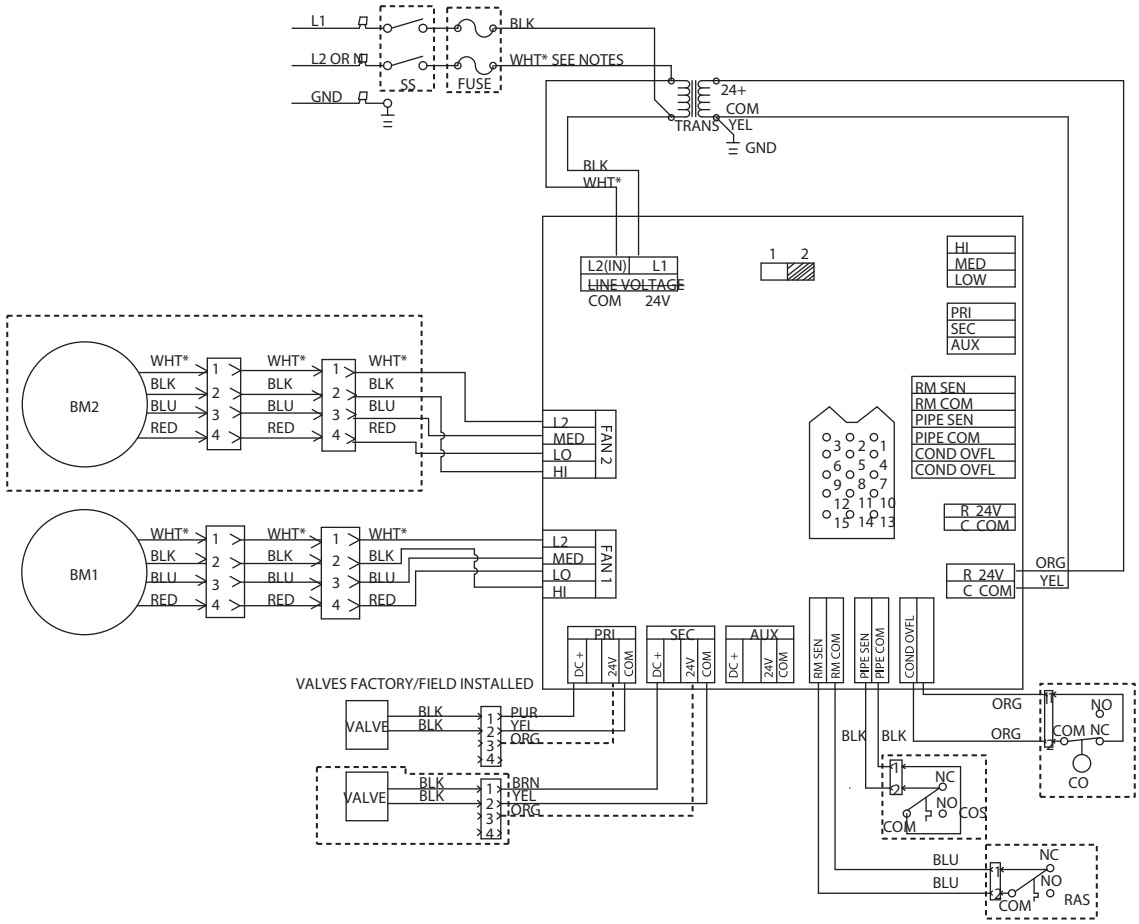


Figure 12: 24 V Control

Connecting Ductwork

All ductwork and/or supply and return grilles shall be installed in accordance with the project plans and specifications. If not included on the unit or furnished from the factory, supply and return grilles shall be provided as recommended in the product catalog.

NOTE: When installing units with plenums that attach to branch duct piping, use industry approved duct standards and configuration such as those published by Air Conditioning Contractors of America or American Society of Heating, Refrigeration and Air Conditioning Engineers. The standards provide necessary information on sizing, layout and installing supply and return air duct systems. Following these guidelines will ensure a quiet, low static system that has uniform air distribution.

For units with no return-air ductwork, check local code requirements for possible application restrictions. All units must be installed in areas that are noncombustible.

Some models are designed to be connected to ductwork with a **MINIMUM** amount of external static pressure. These units may be damaged by operation without the proper ductwork connected. Consult the approved submittals and the product catalog for unit external static pressure limitations.

NOTE: None of these methods will adequately protect a coil in the event of power failure. The safest method of freeze protection is to use glycol in the proper percent solution for the coldest expected air temperature.

Flexible duct connections should be used on all air handling equipment. All ductwork and insulation shall be installed to allow proper access to all components for service and repair such as filters, motor/blower assemblies, etc.

The manufacturer assumes no responsibility for undesirable system operation due to improper design, equipment

or component selection, and/or installation of base unit, ductwork, grilles, and other related components.

Exposed Unit Finish Touch-up and Repaint

Exposed cabinet units may be furnished with a baked enamel finish. Repair small scratches in this finish with touch up paint available from the factory. Some colors of touch up paint are available in aerosol containers and all touch up paint is available in pint, quart, and gallon cans. Contact the factory for availability.

Follow proper safety procedures regarding ventilation and safety equipment. Follow the manufacturer's directions for the products being used.

To repaint the factory-baked enamel, prepare the finish surface by light sanding with #280 grit sand paper, or #000 or #0000 fine steel wool. The surface may also be wiped with a liquid surface etch cleaning product such as "No Sand" or "Pasceo." These items are available at most paint product stores. Note that the more conscientiously this preparation is done, the more effective it will be.

After this preparation is accomplished, the factory finish should provide excellent adhesion for a variety of air-dried top coats. Enamel will give a more durable, higher gloss finish, while latex will not adhere as well and will give a dull, softer finish. Avoid top coats involving an exothermic chemical process between two components, such as epoxies and urethanes.

Factory aerosol touch up paint may require a number of light "dust coats" to isolate the factory-baked enamel finish from the quick drying touch up paint.

Make Final Preparations

1. Turn off power to the unit (open unit electrical disconnect) and install lockout tags on all power supplies to unit.
2. Install thermostats and perform any other final wiring as applicable. Ensure all electrical connections are tight.
3. Perform a final visual inspection. All equipment, plenums, ductwork, and piping should be inspected to verify that all systems are complete and properly installed and mounted, and that no debris or foreign articles such as paper or drink cans are left in the units or other areas. Clean dirt, dust, and other construction debris from unit interior. Be sure to check fan wheel and housing and clean if necessary.
4. Rotate fan wheel by hand to be sure it is free and does not rub housing. Check that wing nuts securing fan assembly to fan deck are tight. Adjust if necessary.
5. Install filter in frame at front of coil. If field-supplied filters are used, be sure size is as specified in Table 2.
6. Ensure all panels and filters are installed before checking fan operation. Turn on power to the unit.
7. Check the fan and motor operation.
8. Verify drain line is properly and securely positioned and that the line is clear. Pour water into drain to check operation.

Unit Size	Nominal One-Inch Filter Size – Inches (Millimeters)
	FHC, FXC, FVC
02	7-3/4" x 21-3/4" (197 x 552)
03	7-3/4" x 25-3/4" (197 x 654)
04	7-3/4" x 31-3/4" (197 x 806)
05	7-3/4" x 31-3/4" (197 x 806)
06	7-3/4" x 41-3/4" (197 x 1060)
08	7-3/4" x 43-3/4" (197 x 1111)
10	7-3/4" x 57-3/4" (197 x 1467)
12	7-3/4" x 65-3/4" (197 x 1670)

Table 2: Filter Sizes

SECTION 4 – Startup

Before beginning any startup operation, the startup personnel shall familiarize themselves with the unit, options and accessories, and control sequence to understand the proper system operation. All personnel shall have a good working knowledge of general startup procedures and have the appropriate startup and balancing guides available for consultation.

The building must be completely finished including doors, windows, and insulation. All internal walls and doors should be in place and in the normal position. In some cases, the interior decorations and furniture may influence overall system performance. The entire building should be as complete as possible before beginning any system balancing.

The initial step in any startup operation shall be a final visual inspection. All equipment, plenums, ductwork, and piping shall be inspected to verify that all systems are complete and properly installed and mounted, and that no debris or foreign articles such as paper or drink cans are left in the units or other areas.

Check each unit for loose wires, free blower wheel operation, and loose or missing access panels or doors. Except as required during startup and balancing operations, no fan coil units shall be operated without all the proper ductwork attached, supply and return grilles in place, and all access doors and panels in place and secure. A clean filter of the proper size and type must also be installed. Failure to do so may result in damage to the equipment or building and furnishings, and/or void all manufacturer warranties.

Cooling/Heating System

Prior to the water system startup and balancing, flush the chilled/hot water systems to clean out dirt and debris which may have collected in the piping during construction. During this procedure, all unit service valves must be in the closed position to prevent foreign matter from entering the unit and clogging the valves and metering devices. Strainers shall be installed in the piping mains to prevent such material from entering units during normal operation.

During system filling, air venting from the unit is accomplished by the use of the standard, manual air vent fitting, or the optional, automatic air vent fitting installed on the coil. Manual air vents are basically Schrader valves. To vent the air from the coil, depress the valve until the air has vented the coil. When water begins to escape through the valve, release the valve. Automatic air vents may be unscrewed one turn counterclockwise to speed initial venting, but should be screwed in for automatic venting after startup operations.

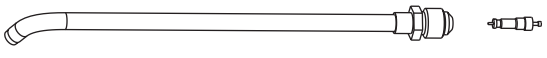


Figure 13: Manual Air Vent

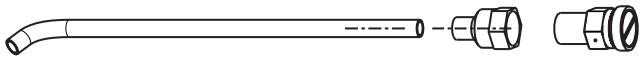


Figure 14: Automatic Air Vent

CAUTION: The air vent provided on the unit is not intended to replace the main system air vents and may not release air trapped in other parts of the system. Independently inspect the entire system for potential air traps and vent those areas as required. In addition, some systems may require repeated venting over a period of time to properly eliminate air from the system.

Air Balance System

All ductwork must be complete and connected. All grilles, filters, and access doors and panels must be properly installed to establish actual system operating conditions BEFORE beginning air balancing operations.

Each individual unit and the attached ductwork is a unique system with its own operating characteristics. For this reason, air balancing is normally done by balance specialists who are familiar with all procedures required to properly establish air distribution and fan-system operating conditions. These procedures shall not be attempted by unqualified personnel.

Exposed units without ductwork do not require air balancing other than selecting the desired fan speed.

After proper system operation is established, the actual unit air delivery and the actual fan motor amperage draw for each unit should be recorded in a convenient place for future reference.

Water Balancing System

A complete knowledge of the hydronic system, along with its components and controls, is essential to proper water system balancing. This procedure shall not be attempted by unqualified personnel. The system must be complete, and all components must be in operating condition BEFORE beginning water system balancing operations.

Each hydronic system has different operating characteristics depending on the devices and controls used in the system. The actual balancing technique may vary from one system to another.

After the proper system operation is established, record the appropriate system operating conditions such as various water temperatures and flow rates in a convenient place for future reference.

Before, and during water system balancing, conditions may exist due to incorrect system pressures which may result in noticeable water noise or undesired valve operation. After the entire system is balanced, these conditions will not exist on properly designed systems.

Water Treatment

Proper water treatment is a specialized industry. IEC recommends consulting an expert in this field to analyze the water for compliance with the water quality parameters listed below, and to specify the appropriate water treatment regimen. The expert may recommend typical additives such as rust inhibitors, scaling preventative, antimicrobial growth agents, or algae preventatives. Anti-freeze solutions may also be used to lower the freezing point.

IEC water coil tubes and headers are constructed of pure copper. Multiple brass alloys may be present in the valve package, depending on unit configuration. It is the user's responsibility to ensure the tube and piping materials furnished by IEC, are compatible with the treated water.

Failure to provide proper water quality will void the fan coil unit's warranty.

Water Containing	Required Concentration
Sulphate	Less than 200 ppm
pH	7.0 – 8.5
Chlorides	Less than 200 ppm
Nitrate	Less than 100 ppm
Iron	Less than 4.5 mg/l
Ammonia	Less than 2.0 mg/l
Manganese	Less than 0.1 mg/l
Dissolved Solids	Less than 1000 mg/l
CaCO3 Hardness	300 - 500 ppm
CaCO3 Alkalinity	300 - 500 ppm
Particulate Quantity	Less than 10 ppm
Particulate Size	800 micron max

Table 3: Water Quality Concentrations

Eco-telligent® Motor

If the unit is equipped with an ECM blower, additional steps may be required during the air balancing process. Review project submittals or order acknowledgement to determine which ECM control scheme the unit has. Alternatively, match the control board to the illustrations.

CAUTION: Both of the procedures described below require the control box to be powered while adjustments are made. Line voltage components are concealed behind a secondary cover. However, installer should still take all reasonable precautions to prevent electrical shock or arching.

3-Speed, Potentiometer Adjustment (Eco 2 Only)

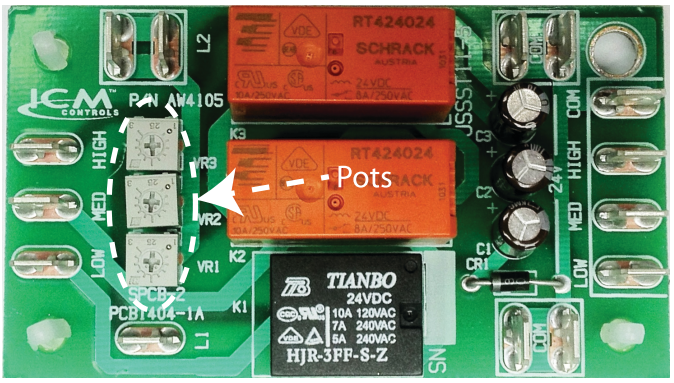


Figure 15: Potentiometer Board

The unit has been factory configured to produce PSC equivalent airflow on high speed, with medium and low speed set at 80% and 60% of high, respectively. If these settings are acceptable, then no further configuring is required.

If alternative airflows are desired, use board mounted potentiometers to adjust the airflow associated with each input. Each speed output can be adjusted from 0 to 100% of the motor's factory programmed operating range. Use voltmeter and airflow chart (on control box cover) to set values. Refer to Appendix A for adjustment procedure.

4-Speed, Solid State with Potentiometer

See photo in Appendix B. The unit has been factory configured to produce PSC equivalent airflow on high speed, with medium and low speed set at 80% and 60% of

high, respectively. If these settings are acceptable, then no further configuring is required.

Board mounted potentiometers are provided to adjust the airflow pertaining to each output. Each output can be adjusted from 0 to 100% of the motor's factory programmed operating range. Use voltmeter and airflow chart (on control box cover) to set values. Refer to Appendix B for adjustment procedure.

Eco 2 Variable Airflow for 0-10 VDC

No control board is required and no field adjustments are possible. Motor uses 0-10VDC signal directly. See control box label. Fan enable at 1.5VDC.

Controls Operation

Before proper control operation can be verified, all other systems must be operating properly. The correct water and air temperatures must be present for the control function being tested. Some controls and features are designed to not operate under certain conditions. For example, on a 2-pipe cooling/heating system with auxiliary electric heat, the electric heater cannot be energized with hot water in the system.

A wide range of controls, electrical options and accessories may be used with the equipment covered in this manual. Consult the approved unit submittals, order acknowledgements, and other literature for detailed information regarding each individual unit and its controls. Since controls and features may vary from one unit to another, care must be taken to identify the controls used on each unit and their proper control sequence. Information provided by component manufacturers regarding installation, operation, and maintenance of their individual controls is available upon request.

SECTION 5 – Service/Maintenance

General

Each unit on a job will have its own unique operating environment and conditions which may dictate a maintenance schedule for that unit that is different from other equipment on the job. A formal schedule of regular maintenance and an individual unit log should be established and maintained. This will help to achieve the maximum performance and service life of each unit on the job.

Information regarding safety precautions contained in the preface at the beginning of this manual shall be followed during any service and maintenance operations.

For more detailed information concerning service operations consult your IEC Sales Representative or the factory.

Motor/Blower Assembly

The type of fan operation is determined by the control components and their method of wiring. This may vary from unit to unit. Refer to the wiring diagram that is attached to each unit for that unit's individual operating characteristics.

All motors have permanently lubricated bearings. No field lubrication is required.

Should the assembly require service, the motor/blower assembly may be removed from the unit to facilitate such operations as motor or blower wheel/housing replacement, etc.

Dirt and dust should not be allowed to accumulate on the blower wheel or housing. This can result in an unbalanced blower wheel condition which can damage a blower wheel or motor. The wheel and housing may be cleaned periodically using a vacuum cleaner and a brush taking care not to dislodge the factory balancing weights on the blower wheel blades.

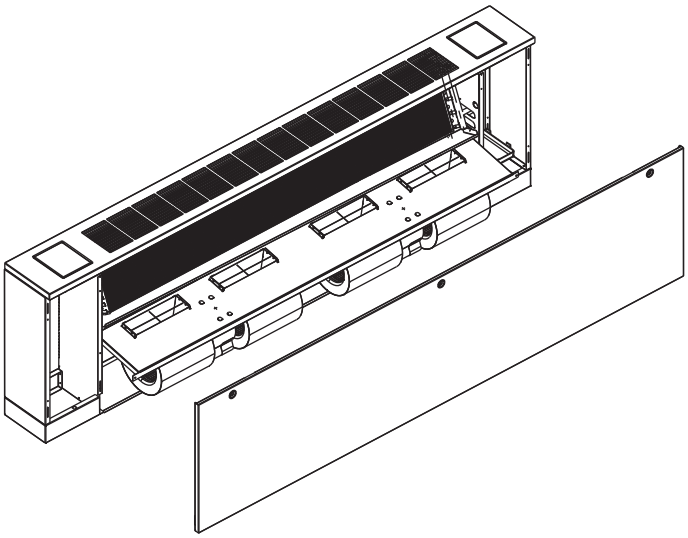


Figure 16: Motor Blower Deck Servicing

Coil

Coils may be cleaned by removing the motor/blower assemblies and brushing the entering air face between fins with a stiff brush. Brushing shall be followed by cleaning with a vacuum cleaner. If a compressed air source is available, the coil may also be cleaned by blowing air through the coil fins from the leaving air face. This shall again be followed by vacuuming. Units provided with the proper type of air filters, replaced regularly, will require less frequent coil cleaning.

Electric Resistance Heater Assembly

Electric resistance heaters typically require no normal periodic maintenance when unit air filters are changed properly. The operation and service life may be affected by other conditions and equipment in the system. The two most important operating conditions for an electric heater are proper airflow and proper supply voltage. High supply voltage and/or poorly distributed or insufficient airflow over the element will result in element overheating and possible limit switch openings.

This condition may result in the heater cycling on the high limit thermal cutout. Sheath heaters have automatic reset switches only. Open-strip heaters have an automatic reset switch with a backup, high-limit thermal switch. Automatic reset limit switches are as the name implies, they reset automatically after the heater has cooled down.

High-limit thermal switches must be replaced once the circuit has been broken. The high-limit thermal cutout device is a safety device only, and is not intended for continuous operation. This device only operates when a problem exists, and ANY condition that causes high-limit cutout MUST be corrected immediately. High supply voltage also causes excessive amperage draw and may trip the circuit breaker or blow the fuses on the incoming power supply.

After proper airflow and supply power are assured, regular filter maintenance is important to provide clean air over the heater. Dirt that is allowed to deposit on the heating element will cause hot spots and eventual element burn through. These hot spots will normally not be enough to trip the high-limit thermal cut-out device, and may not be evident until actual heater element failure.

Electrical Wiring and Controls

The electrical operation of each unit is determined by the components and wiring of the unit. This may vary from unit to unit. Consult the wiring diagram attached to the unit for the actual type and number of controls provided on each unit.

The integrity of all electrical connections should be verified at least twice during the first year of operation. Afterwards, all controls shall be inspected periodically for proper operation. Some components may experience erratic operation or failure due to age. Wall thermostats may also become clogged with dust and lint, and shall be periodically inspected and cleaned to provide reliable operation.

When replacing any components such as fuses, contactors, or relays, use only the exact type, size and voltage component as furnished from the factory. Any deviation without factory authorization could result in personnel injury or damage to the unit. This will also void all factory warranties. **Only factory supplied replacement parts ensure that the warranty and agency status remain in effect.** All repair work shall be done in such a manner as

to maintain the equipment in compliance with governing codes, ordinances and testing agency listings.

More specific information regarding the use and operating characteristics of the standard controls offered by the manufacturer are contained in other manuals.

Valves and Piping

No formal maintenance is required on the valve-package components most commonly used with fan coil units other than a visual inspection for possible leaks in the course of other normal periodic maintenance. In the event that a valve must be replaced, the same precautions taken during the initial installation to protect the valve package from excessive heat should also be used during replacement.

Filters, Throwaway

The type of throwaway filter most commonly used on fan coil units shall be replaced on a regular basis. The time interval between each replacement shall be established based on regular inspection of the filter, and should be recorded in the log for each unit. Refer to the product catalog for the recommended filter size for each product type and size. If the replacement filters are not purchased from the factory, the filters used should be the same type and size as those furnished from, or recommended by the factory. Pleated media, or extended surface filters shall not be used since the high air pressure drops encountered with these types of filters is not compatible with the type of fan coil unit covered in this manual. Consult the factory for applications using filter types other than the factory standard or optional product.

Filters, Permanent

A maintenance schedule for permanent filters shall be developed in the same manner as throwaway filters. Unlike throwaway filters, permanent filters may be cleaned and reinstalled in the unit instead of being discarded when dirty. The optional factory permanent filter may be cleaned in hot soapy water to remove any trapped dirt then set aside on edge to dry.

Before replacing the filter in the unit, it should be recharged with some type of entrapment film such as "Film Cor Recharging Oil." The filter shall be sprayed on both sides or submerged in the film to assure complete coverage. The filter should not be allowed to soak in the film, but should be immediately removed and the excess film drained from the filter before reinstallation in the unit. Consult a local filter supplier for types of available cleaning solutions and charging films.

Note that permanent filters normally have less static pressure loss than throwaway filters.

Drain

The drain shall be checked before initial startup, and at the beginning of each cooling season to assure that the drain trap, and line are clear. If it is clogged, take steps to clear the debris so that condensate will flow easily.

Make periodic checks of the drain during the cooling season to maintain a free-flowing condensate. Units provided with a secondary or "tell-tale" drain connection will indicate a clogged main-drain line by flow from the "tell-tale" connection.

Should the growth of algae and/or bacteria be a concern, consult an air conditioning and refrigeration supply organization familiar with local conditions for chemicals, or other solutions available to control these agents.

Replacement Parts (1-866-432-7278)

Use factory replacement parts wherever possible to maintain unit performance, it's normal operating characteristics, and the testing agency listings. Replacement parts may be purchased through a local IEC Sales Representative.

Contact the local Sales Representative or the factory before attempting any unit modifications. Any modifications not authorized by the factory could result in personnel injury, damage to the unit, and could void all factory warranties.

When ordering parts, the following information must be supplied to ensure proper part identification:

1. Complete unit model number
2. Unit serial number
3. Unit hand connection (right or left hand) while facing into the air stream
4. Complete part description including any numbers

On warranty replacements, in addition to the information previously listed, the unit shipping code which appears on the upper right-hand corner of the serial plate is required. Contact the factory for authorization to return any parts such as defective parts replaced in warranty. All shipments returned to the factory must be marked with a Return Authorization Number which is provided by the factory.

SECTION 6 – Equipment Startup Check List

IMPORTANT

Fan coil units must be filled with water before operating the circulator. The circulator bearings are water lubricated and should not be allowed to operate dry. Filling the system properly will result in immediate lubrication of the bearings.

Receiving and Inspection

- ❑ Unit received undamaged
- ❑ Unit received complete as ordered
- ❑ "Furnish only" parts accounted for
- ❑ Unit arrangement/hand correct
- ❑ Unit structural support complete and correct

Handling and Installation

- ❑ Mounting grommets/isolators used
- ❑ Unit mounted level and square
- ❑ Proper access provided for unit and accessories
- ❑ Proper electrical service provided
- ❑ Proper overcurrent protection provided
- ❑ Proper service switch/disconnect provided
- ❑ Proper chilled water line size to unit
- ❑ Proper hot water line size to unit
- ❑ Proper piping insulation
- ❑ All services to unit in code compliance
- ❑ All shipping screws and braces removed
- ❑ Unit protected from dirt and foreign matter

Cooling/Heating Connections

- ❑ Protect valve package components from heat
- ❑ Mount valve packages
- ❑ Connect field piping to unit
- ❑ Pressure test all piping for leaks
- ❑ Install drain line and traps, as required
- ❑ Insulate all piping, as required
- ❑ Install drip lip under piping, as required

Ductwork Connections

- ❑ Install ductwork, fittings and grilles, as required
- ❑ Flexible duct connections at unit
- ❑ Proper supply and return grille type and size
- ❑ Control outside air for freeze protection
- ❑ Insulate all ductwork, as required

Electrical Conditions

- ❑ Refer to unit wiring diagram
- ❑ Connect incoming power service or services
- ❑ Install and connect "furnish only" parts

Unit Startup

- ❑ General visual unit and system inspection
- ❑ Check for proper fan rotation
- ❑ Record electrical supply voltage
- ❑ Check all wiring for secure connections
- ❑ Close all unit isolation valves
- ❑ Flush water systems
- ❑ Fill systems with water/refrigerant
- ❑ Vent water systems, as required
- ❑ All ductwork and grilles in place
- ❑ All unit panels and filters in place
- ❑ Start fans, pumps, chillers, etc.
- ❑ Check for overload conditions of all units
- ❑ Check all ductwork and units for air leaks
- ❑ Balance water systems, as required
- ❑ Balance air systems, as required
- ❑ Record all final settings for future use
- ❑ Check piping and ductwall for vibration
- ❑ Check all dampers for proper operation
- ❑ Verify proper cooling operation
- ❑ Verify proper heating operation
- ❑ Reinstall all covers and access panels
- ❑ Verify proper condensate drainage

Motor

- ❑ Voltage:

L	N

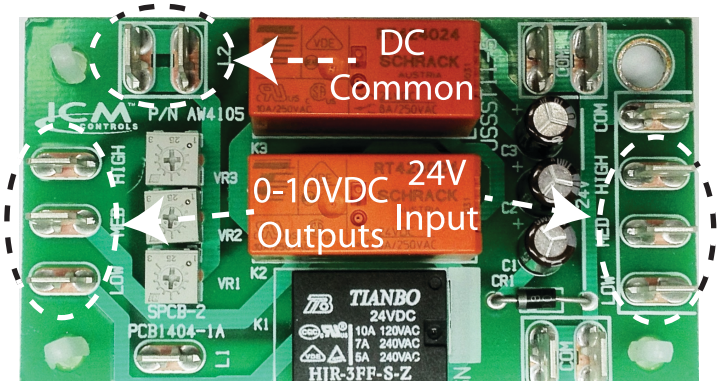
L_1	L_2	L_3

- ❑ Amperage:

Low	
Med	
High	

Appendix A

Adjustment of ICM AW4105

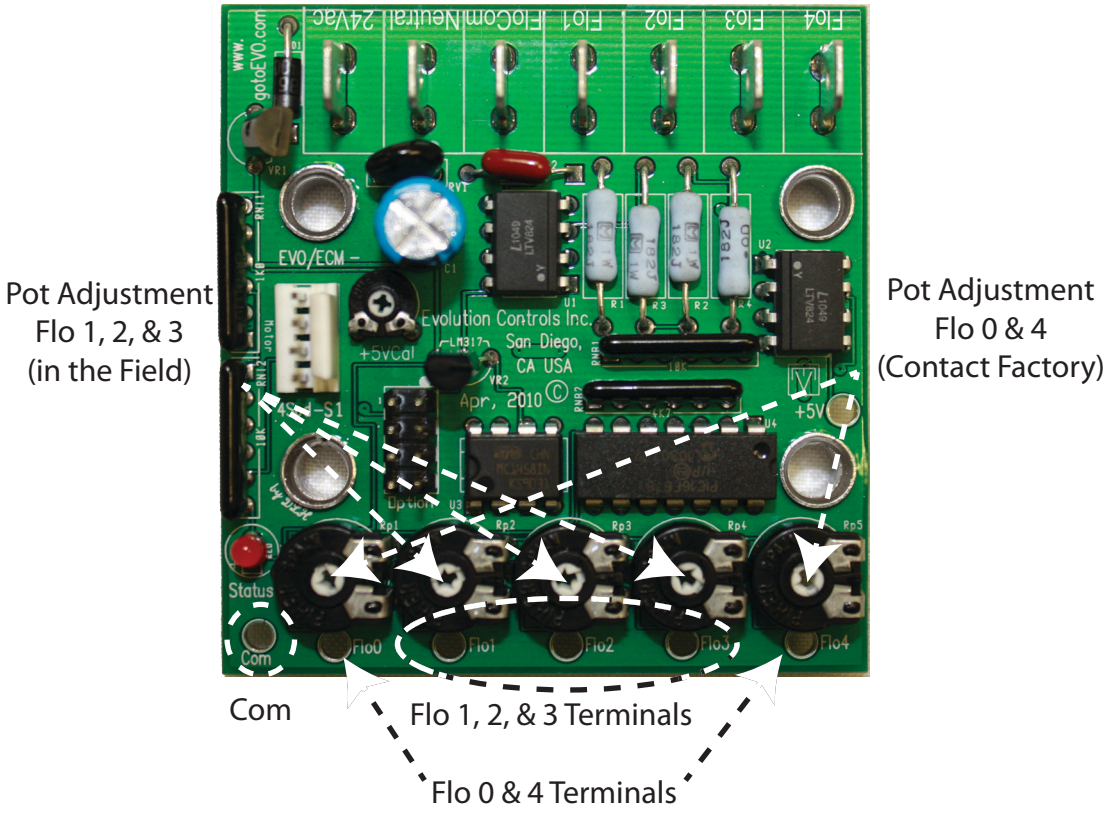


Adjusting the Low, Medium, and High potentiometers requires the use of a Multi-meter capable of measuring 0~5 vdc.

1. Only trained and qualified individuals should attempt to adjust or service components on any electrical component. Failure to follow safety rules could result in electrical shock or hazard.
2. Unit must be powered to perform the following procedure. If main power is not available, IEC recommends connecting a temporary 24 V-40VA power supply in parallel with the secondary outputs of the unit's transformer.
3. Set the electrical multimeter to Volts Direct Current (Vdc) on the 0~5 or 0~20 Vdc scale
4. Attach black (negative) lead of meter to the DC common terminal, labeled "L2" above the potentiometers and to the left of the orange relay.
5. Attach the red (positive) lead of the meter to the red wire that bridges the 0-10VDC outputs: high, medium, and low.
6. High Speed: Close High speed relay by applying 24 V to the High terminal. Using a small screwdriver turn the VR3 potentiometer so the meter measures 4.51 Vdc. This will set the ECM speed to 90% of maximum for high speed. Open the high speed relay.
7. Medium Speed: Close medium speed relay by applying 24 V to the medium terminal. Using a small screwdriver turn the VR2 potentiometer so the meter measures 3.53 Vdc. This will set the ECM speed to 70% of maximum speed for medium speed operation. Open the medium speed relay.
8. Low Speed: Close low speed relay by applying 24 V to the low terminal. Using a small screwdriver turn the VR1 potentiometer so the meter measures 2.06 Vdc. This will set the ECM speed to 40% of maximum speed for low speed operation. Open the low speed relay.

Appendix B

Adjustment of EVO/ECM-4SPD



Adjusting the Flo1, Flo2, Flo3 potentiometers requires the use of a Multi-meter capable of measuring 0~5 vdc.

1. Only trained and qualified individuals should attempt to adjust or service components on any electrical component. Failure to follow safety rules could result in electrical shock or hazard.
2. 24 vac power must be supplied to ECM board to make adjustments
3. Set the electrical multimeter to Volts Direct Current (Vdc) on the 0~5 or 0~20 Vdc scale
4. Attach black (negative) lead of meter to the "Com" terminal to the left of the potentiometers and below the Status light
5. Attach the red (positive) lead of the meter to the high speed "Flo1" terminal below the Potentiometer
6. High Speed: Using a small screwdriver turn the Flo1 potentiometer so the meter measures 4.51 Vdc. This will set the ECM speed to 90% of maximum for high speed
7. Medium Speed: Using a small screwdriver turn the Flo2 potentiometer so the meter measures 3.53 Vdc. This will set the ECM speed to 70% of maximum speed for medium speed operation
8. Low Speed: Using a small screwdriver turn the Flo3 potentiometer so the meter measures 2.06 Vdc. This will set the ECM speed to 40% of maximum speed for low speed operation
9. For setting of Flo0 and Flo4 contact IEC Service Department, otherwise these potentiometers should be set to full counter clockwise rotation.

TERMS AND CONDITIONS

1. Orders shall not be binding upon International Environmental Corporation, an Oklahoma corporation (hereinafter referred to as "IEC") unless accepted by an authorized representative of IEC at its office in Oklahoma City, Oklahoma. No distributor, sales representative or any other person or entity (except authorized employees of IEC at its office in Oklahoma City, Oklahoma) has any authority whatsoever to bind IEC to any representation or agreement of any kind.

2. IEC does not build items to plans and specifications. IEC agrees to furnish only the items as described in IEC's acknowledgment unless IEC's office in Oklahoma City, Oklahoma has previously received and accepted, in writing, approved submittals from Purchaser.

3. Prices acknowledged are firm only if Purchaser releases the goods covered by this order for immediate production by IEC within sixty (60) days from the date of Purchaser's initial offer to purchase and for shipment by IEC within IEC's estimated shipping date, unless otherwise agreed to in writing by IEC at its office in Oklahoma City, Oklahoma. If Purchaser does not meet the terms and conditions of this paragraph, the prices are subject to escalation to those prices in effect at time of shipment without notice to Purchaser.

4. All prices are F.O.B. IEC's factory, unless otherwise agreed by IEC in writing; and, all payments and prices shall be in U.S.A. dollars.

5. If goods are released for production but IEC is prevented by the Purchaser from shipping upon completion or by IEC's estimated shipping date, whichever is later, IEC may at its option, in addition to all other remedies, invoice Purchaser to be payable within thirty (30) days and store the goods at Purchaser's sole expense.

6. Title to and risk of loss to the goods passes to the Purchaser F.O.B. IEC's factory.

7. **Disclaimer**
It is expressly understood that unless a statement is specifically identified as a warranty, statements made by IEC or its representatives relating to IEC's products, whether oral, written or contained in any sales literature, catalog or any other agreement, are not express warranties and do not form a part of the basis of the bargain, but are merely IEC's opinion or commendation of IEC's products. **EXCEPT AS SPECIFICALLY SET FORTH HEREIN, THERE IS NO EXPRESS WARRANTY AS TO ANY OF IEC'S PRODUCTS. IEC MAKES NO WARRANTY AGAINST LATENT DEFECTS. IEC MAKES NO WARRANTY OF MERCHANTABILITY OF THE GOODS OR OF THE FITNESS OF THE GOODS FOR ANY PARTICULAR PURPOSE.**

8. **Grant of Limited Express Warranty**
IEC warrants IEC products purchased and retained in the United States of America and Canada to be free from defects in material and workmanship under normal use and maintenance as follows: (1) All complete fan coil units built or sold by IEC for twelve (12) months from date of unit start up or eighteen (18) months from date of shipment (from factory), whichever comes first.

   All parts must be returned to IEC's factory in Oklahoma City, Oklahoma, freight prepaid, no later than sixty (60) days after the date of the failure of the part; if IEC determines the part to be defective and within IEC's Limited Express Warranty, IEC shall, when such part has been either replaced or repaired, return such to a factory recognized contractor or service organization, F.O.B. IEC's factory, Oklahoma City, Oklahoma, freight prepaid. The warranty on any parts repaired or replaced under warranty expires at the end of the original warranty period. For information and warranty service contact:

   International Environmental Corporation
   Customer Service
   5000 West I-40
   Oklahoma City, OK 73128
   (405) 605-5000

   This warranty does not cover and does not apply to: (1) Air filters, fuses, fluids; (2) Products relocated after initial installation; (3) Any portion or component of any system that is not supplied by IEC, regardless of the cause of the failure of such portion or component; (4) Products on which the unit identification tags or labels have been removed or defaced; (5) Products on which payment to IEC is or has been in default; (6) Products which have defects or damage which result from improper installation, wiring, electrical imbalance characteristics or maintenance; or are caused by accident, misuse or abuse, fire, flood, alteration or misapplication of the product; (7) Products which have defects or damage which result from a contaminated or corrosive air or liquid supply or operation at abnormal temperatures; (8) Mold, fungus or bacteria damages; (9) Products subjected to corrosion or abrasion; (10) Products manufactured or supplied by others; (11) Products which have been subjected to misuse, negligence or accidents; (12) Products which have been operated in a manner contrary to IEC's printed instructions; or (13) Products which have defects, damage or insufficient performance as a result of insufficient or incorrect system design or the improper application of IEC's products.

   IEC is not responsible for: (1) The cost of any fluids or other system components, or associated labor to repair or replace the same, which is incurred as a result of a defective part covered by IEC's Limited Express Warranty; (2) The costs of labor, materials or service incurred in removal of the defective part, or in obtaining and replacing the new or repaired part; or, (3) Transportation costs of the defective part from the installation site to IEC or of the return of any part not covered by IEC's Limited Express Warranty.

   Limitation: This Limited Express Warranty is given in lieu of all other warranties. If, notwithstanding the disclaimers contained herein, it is determined that other warranties exist, any such warranties, including without limitation any express warranties or any implied warranties of fitness for particular purpose and merchantability, shall be limited to the duration of the Limited Express Warranty.

9. **Limitation of Remedies**
In the event of a breach of the Limited Express Warranty, IEC will only be obligated at IEC's option to repair the failed part or unit or to furnish a new or rebuilt part or unit in exchange for the part or unit which has failed. If after written notice to IEC's factory in Oklahoma City, Oklahoma of each defect, malfunction or other failure and a reasonable number of attempts by IEC to correct the defect, malfunction or other failure and the remedy fails of its essential purpose, IEC shall refund the purchase price paid to IEC in exchange for the return of the sold good(s). Said refund shall be the maximum liability of IEC. **THIS REMEDY IS THE SOLE AND EXCLUSIVE REMEDY OF THE BUYER OR THEIR PURCHASER AGAINST IEC FOR BREACH OF CONTRACT, FOR BREACH OF ANY WARRANTY OR FOR IEC'S NEGLIGENCE OR IN STRICT LIABILITY.**

10. **Limitation of Liability**
IEC shall have no liability for any damages if IEC's performance is delayed for any reason or is prevented to any extent by any event such as, but not limited to: any war, civil unrest, government restrictions or restraints, strikes, or work stoppages, fire, flood, accident, shortages of transportation, fuel, material or labor, acts of God or any other reason beyond the sole control of IEC. **IEC EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGE IN CONTRACT, FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY, OR IN TORT, WHETHER FOR IEC's NEGLIGENCE OR AS STRICT LIABILITY.**

11. IEC shall have no system design, application or maintenance responsibility or responsibility for mold, fungus or bacteria to Purchaser or any other third party.

12. All sales, goods and services, use, excise, value added, transportation, privilege, occupational consumption, storage, document, transaction or other taxes which may be levied by any taxing authority as a result of this transaction shall be paid by the Purchaser.

13. Unless otherwise agreed to in writing by IEC any technical data furnished in conjunction with this order and not obtainable from another source shall not be duplicated, used, or disclosed in whole or in part for any purpose other than to evaluate this order.

14. IEC shall have no liability or other obligation hereunder, if IEC's performance is delayed for any reason or is prevented to any extent by any event such as, but not limited to: any act of God, strike or work stoppage, fire, flood, accident, allocation, or other controls of Government authorities, shortages of transportation, fuel, material or labor, or any other cause beyond IEC's sole control. Any shipping date stated by IEC is IEC's best estimate but IEC makes no guarantee of shipment by any such date and shall have no liability or other obligation for failure to ship on such date, regardless of cause.

15. Payment terms are net thirty (30) days from date of shipment on approved credit. One and one half percent (1 1/2%) per month (18% annual rate) may be charged on past due accounts or the highest rate permitted by applicable law, whichever is lesser. In the event the account is placed for collection, Purchaser shall be responsible for all reasonable attorneys fees or costs on a solicitor and client basis, plus all other costs and expenses incurred by IEC in securing payment.

16. Purchaser shall not cancel the contract without prior written consent of an authorized representative of IEC at its offices in Oklahoma City, Oklahoma. In the event Purchaser cancels the contract with the prior written consent of IEC after the Purchaser's offer to purchase is received and acknowledged in writing, IEC shall be entitled to receive from Purchaser IEC's cost incurred to time of cancellation plus a reasonable allowance for overhead and profit.

17. Purchaser shall not assign any of its interest or rights under this agreement without written consent of IEC.

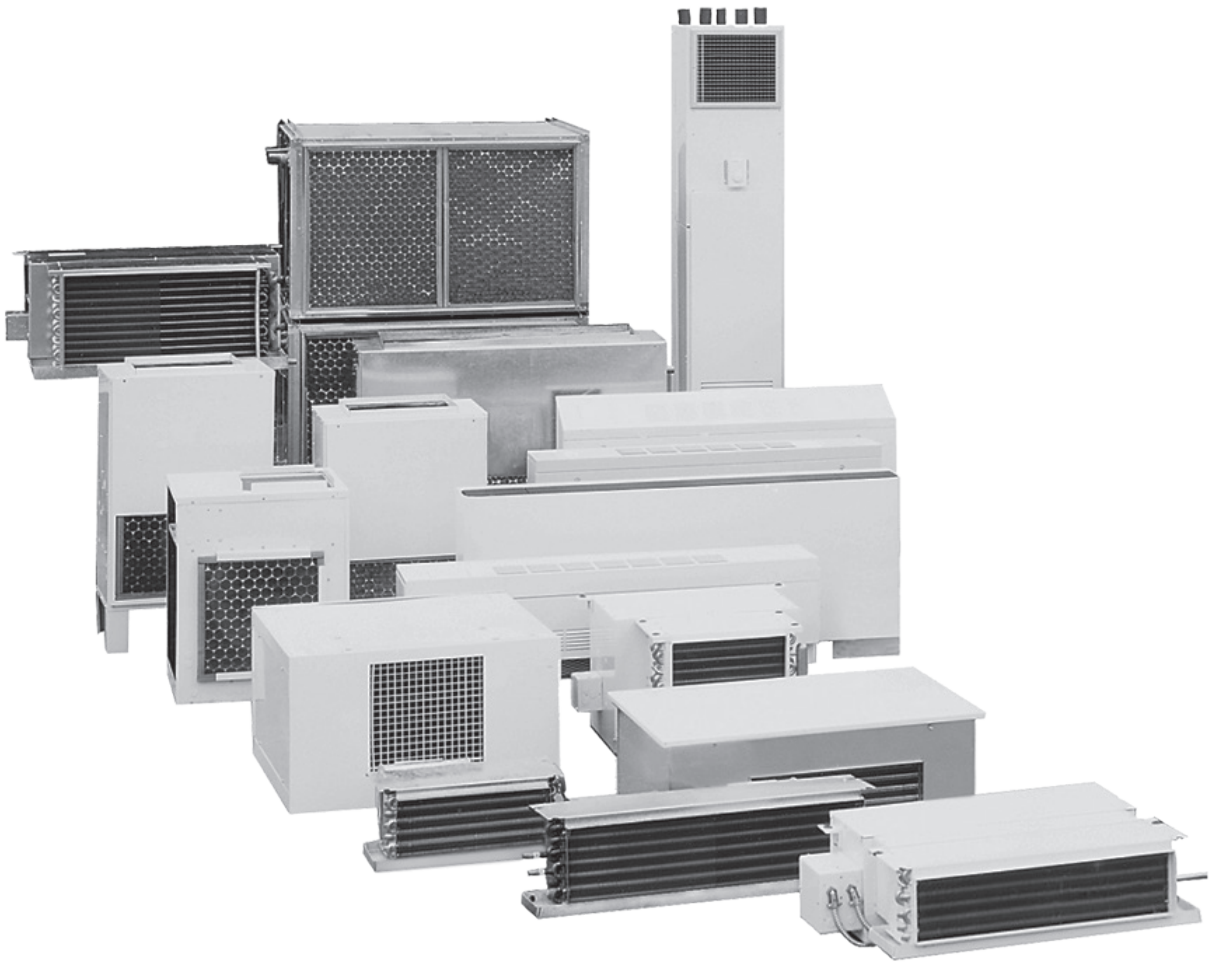
18. IEC will protect all its lien rights. IEC will not furnish lien waivers or releases until IEC receives payment, in full, at its office in Oklahoma City, Oklahoma from Purchaser for the goods covered by this order. There is no authorized retainage for any reason.

19. This Agreement shall be construed, and the rights and liabilities of the parties hereunder shall be determined in accordance with the laws of the State of Oklahoma. If it shall be found that any portion of this agreement violates any particular law of the United States or any state in the United States having jurisdiction or, if applicable, any law of Canada or any province or territory in Canada having jurisdiction, such portion of the agreement shall be of no force and effect in that political unit, division or sub-division in which they are illegal or unenforceable and the agreement shall be treated as if such portion or portions had not been inserted. In the event that any dispute or disagreement in connection with any order should arise or exist between Purchaser and IEC, jurisdiction and venue for any legal action shall be, if IEC so elects, exclusively in the state or federal courts in Oklahoma County, Oklahoma. The statute of limitations on any claim of the Purchaser against the IEC shall be one (1) year from the date the cause of action accrues.

20. Without regard to any other agreement, all obligations of Purchaser to IEC shall become immediately due and payable if Purchaser becomes insolvent or if Purchaser does not make payments when due or breaches any other agreement or fails to perform any obligation.

21. All orders are expressly limited and made conditional upon acceptance by Purchaser of the terms and conditions set forth above without change. There shall be no understandings, agreements, or obligations (outside these terms and conditions) unless specifically set forth in writing and accepted by signature of an authorized representative of IEC in Oklahoma City, Oklahoma.

22. The parties hereto have requested that these presents and all judicial proceedings relating thereto be drafted in English. Les parties aux présentes ont demandé à ce que les présentes et toutes procedures judiciaires y afférentes soient rédigées en anglais



IEC International Environmental

IEC Vertical F*C Series Fan Coils IOM Part #: I100-90013980
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IEC is a subsidiary of LSB Industries, Inc.
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